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### Award Abstract # 1121844

### Numeracy Infusion Course for Higher Education (NICHE): A Project of The City University of New York (CUNY) Quantitative Reasoning (QR) Alliance

<b>NSF Org:</b>	<a href="#">DUE</a> <a href="#">Division Of Undergraduate Education</a>
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<b>Program Manager:</b>	teri murphy DUE Division Of Undergraduate Education EHR Direct For Education and Human Resources
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<b>History of Investigator:</b>	Esther Wilder (Principal Investigator) Esther.Wilder@lehman.cuny.edu Dene Hurley (Co-Principal Investigator) Frank Wang (Co-Principal Investigator)
<b>Recipient Sponsored Research Office:</b>	Research Foundation Of The City University Of New York (Lehman) 250 BEDFORD PARK BLVD BRONX NY US 10468-2524 (718)960-8107
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**ABSTRACT**

The goal of the Numeracy Infusion Course for Higher Education (NICHE) project is to increase the level of quantitative reasoning (QR) instruction and assessment in undergraduate courses across a broad range of disciplines throughout the City University of New York (CUNY) system. The primary tool of the project is a course that teaches faculty: (a) to apply Quantitative Literacy/Quantitative Reasoning (QL/QR) within a disciplinary context; (b) to articulate QR learning goals/objectives that reflect best practices for teaching quantitative literacy; (c) to identify and implement best practices for teaching QR, for example active learning, collaborative student learning, writing with numerical information, etc.; (d) to adapt and implement strategies for incorporating quantitative reasoning into course instruction; and (e) to assess the effectiveness of QR initiatives and use the assessment results to further improve instruction. The intellectual merit of the project has several components. First, faculty enrolled in the NICHE course engage in active and collaborative learning using real-world data, thus experiencing the same progressive teaching methods that have proven effective in undergraduate QR courses. Second, the effectiveness of the project is being evaluated using a rubric that assesses the participating faculty member's QR assignments and assessment materials; and then those faculty are using the Critical Thinking Assessment (CAT) test with their own students. Finally, the project is led by an interdisciplinary group of experienced STEM faculty from throughout the CUNY system who are leaders in the development and application of techniques for progressive QR instruction and assessment. The broader impacts of the project lie primarily in its demonstration of a model for engaging faculty throughout a large and diverse university system of campuses. By identifying and cultivating a cadre of faculty leaders, who then serve to recruit colleagues, the resulting community of faculty is expected to improve the educational experiences of several thousand CUNY students annually. The project is also providing tested QR learning materials and disseminating the NICHE course materials to other institutions who are similarly committed to improving the quantitative literacy and reasoning of their students.

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Wang, Frank. "Development of Students' Bayesian Reasoning Skills: A Case Study." *Numeracy*, v.8, 2015, p.DOI: <http://doi.org/10.1111/num.12111>

Wang, Frank and Esther Isabelle Wilder. "Numeracy Infusion Course for Higher Education, 1: Teaching Faculty How to Improve Students' Quantitative Reasoning Skills through Cognitive Illusions" *Numeracy*, v.8, 2015, p.DOI: <http://doi.org/10.1111/num.12112>

**PROJECT OUTCOMES REPORT****Disclaimer**

This Project Outcomes Report for the General Public is displayed verbatim as submitted by the Principal Investigator (PI) for this award. Any opinions, findings, and conclusions or recommendations expressed in this Report are those of the PI and do not necessarily reflect the views of the National Science Foundation; NSF has not approved or endorsed its content.

The Numeracy Infusion Course for Higher Education (NICHE) provides university faculty with instructional guidance, and support to help them teach quantitative reasoning (QR) to undergraduate students in a wide range of disciplines. Participating faculty were drawn across the City University of New York (CUNY), including both four-year and community colleges. The

The objectives of NICHE are to provide instruction on best practices for teaching QR; to foster the development of instructional materials that make use of effective strategies for teaching QR; to infuse QR into a wide range of disciplines and CUNY colleges; to increase faculty interest and comfort in teaching QR; to strengthen the faculty's own QR skills, if necessary; and to establish a network of faculty who are committed to improving students' QR abilities.

NICHE consists of 8 interactive, online units: (1) QR and making numbers meaningful; (2) QR learning outcomes; (3) The brain, cognition and QR; (4) QR and writing; (5) Discovery methods; (6) Representations of data; (7) QR assessment; and (8) QR stereotypes and culture. Faculty participants undertake a variety of exercises, engage in hands-on activities related to QR pedagogy, and develop QR instructional and assessment materials. The NICHE website ([www.teachqr.com](http://www.teachqr.com)) serves as a complement to the interactive units.

During NICHE, faculty develop instructional materials for their own courses whereby they articulate a set of QR learning goals, provide peer feedback on each other's learning goals, and develop revised learning goals in response to peer feedback; create/adapt a QR lesson plan/exercise, provide peer feedback, and develop a revised lesson plan/exercise in response to peer feedback; create/adapt a QR assessment plan/instrument, provide peer feedback, and develop a revised assessment plan/instrument in response to peer feedback.

Altogether, 44 faculty enrolled in NICHE from 2013-2015, and 34 faculty fulfilled all the program's requirements. (Of the 10 faculty who didn't complete the program, several chose instead to audit the course. Others completed portions of NICHE but had to withdraw due to other commitments, changes in summer plans, or health issues.) The 34 faculty who completed NICHE represent 13 CUNY institutions (8 four-year colleges and 5 community colleges) and more than a dozen disciplines; sixteen (34%) are in the social sciences or business, 9 (26%) in the fine arts or humanities, 5 (15%) in mathematics, and 4 (12%) in other STEM disciplines. Of the NICHE completers, 10 (29%) were men and 24 (71%) were women.

We assessed the NICHE program using pre- and post-instruction skills tests, questionnaires, and an alumni survey. The assessment data reveal that the program has changed the ways in which faculty teach QR within the CUNY system. Most participants reported that they now place a more deliberate emphasis on QR instruction in their courses, incorporate more data analyses and real-world examples into their teaching, and employ best practices such as the

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articulation of learning goals, the provision of active learning opportunities, and the use of formal assessment methods.

In the open-ended survey questions, faculty described how their approaches to teaching QR had changed as a result of their participation in NICHE. For example, an assistant professor at a four-year college wrote, "I am much more confident in my understanding of QR in terms of philosophy, pedagogy and goals. .... We all know that QR is essential to preparing our students for the 21st century, but the rise o...

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